EXHIBIT C

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Morris

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(54) **ROLE-BASED ACCESS TO IMAGE METADATA**

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(58) **Field of Search** 7091217, 219, 7091223, 225, 227, 229; 70719, 10; 7131201

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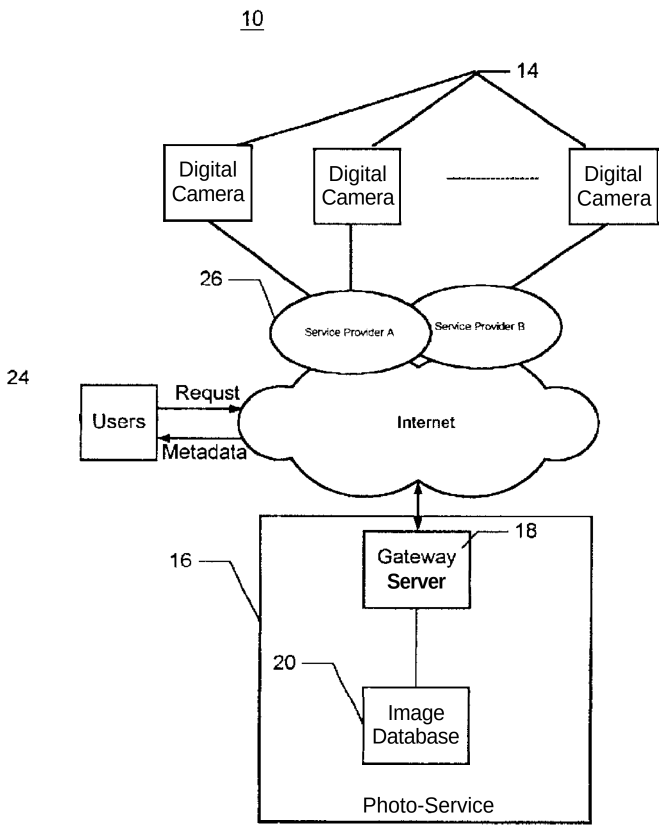
(57) **ABSTRACT**

A system and method for controlling access to image metadata is disclosed, where metadata elements are defined for an image. The method and system include associating users who will access the image with roles, and associating the roles with individual metadata elements. In response to receiving a request for access to the metadata by a particular user, the user's role is determined from the request and the user's role is compared to the roles associated with the metadata elements to determine which metadata elements to make available to the user.

33 **Claims, 6 Drawing Sheets**


10
14
Digital Camera
Digital Camera
Digital Camera
26
Service Provider A
Service Provider B
24
Users
Request
Metadata
Internet
18
16
Gateway Server
20
Image Database
Photo-Service

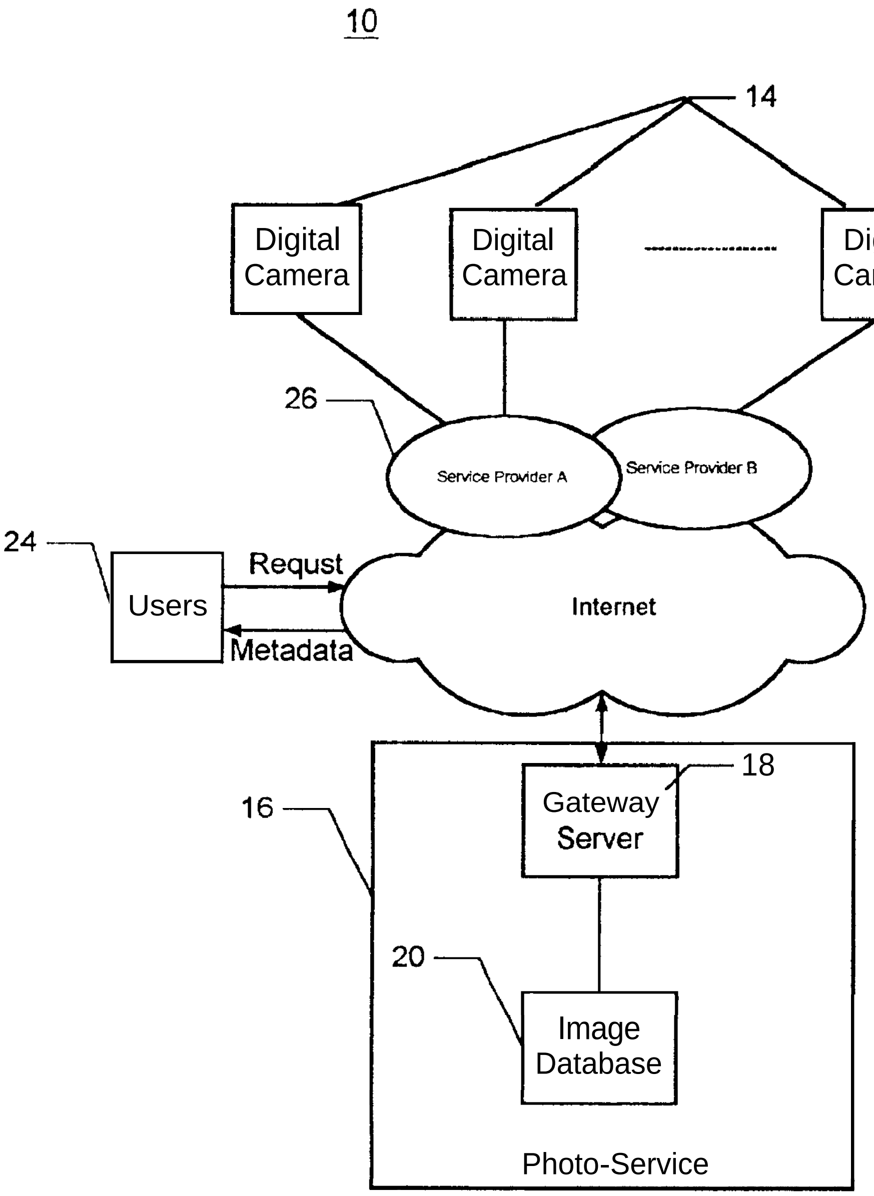

10
14
Digital Camera
Digital Camera
Digital Camera
26
Service Provider A
Service Provider B
24
Users
Requst
Metadata
Internet
16
Gateway Server
18
20
Image Database
Photo-Service

FIG. 1

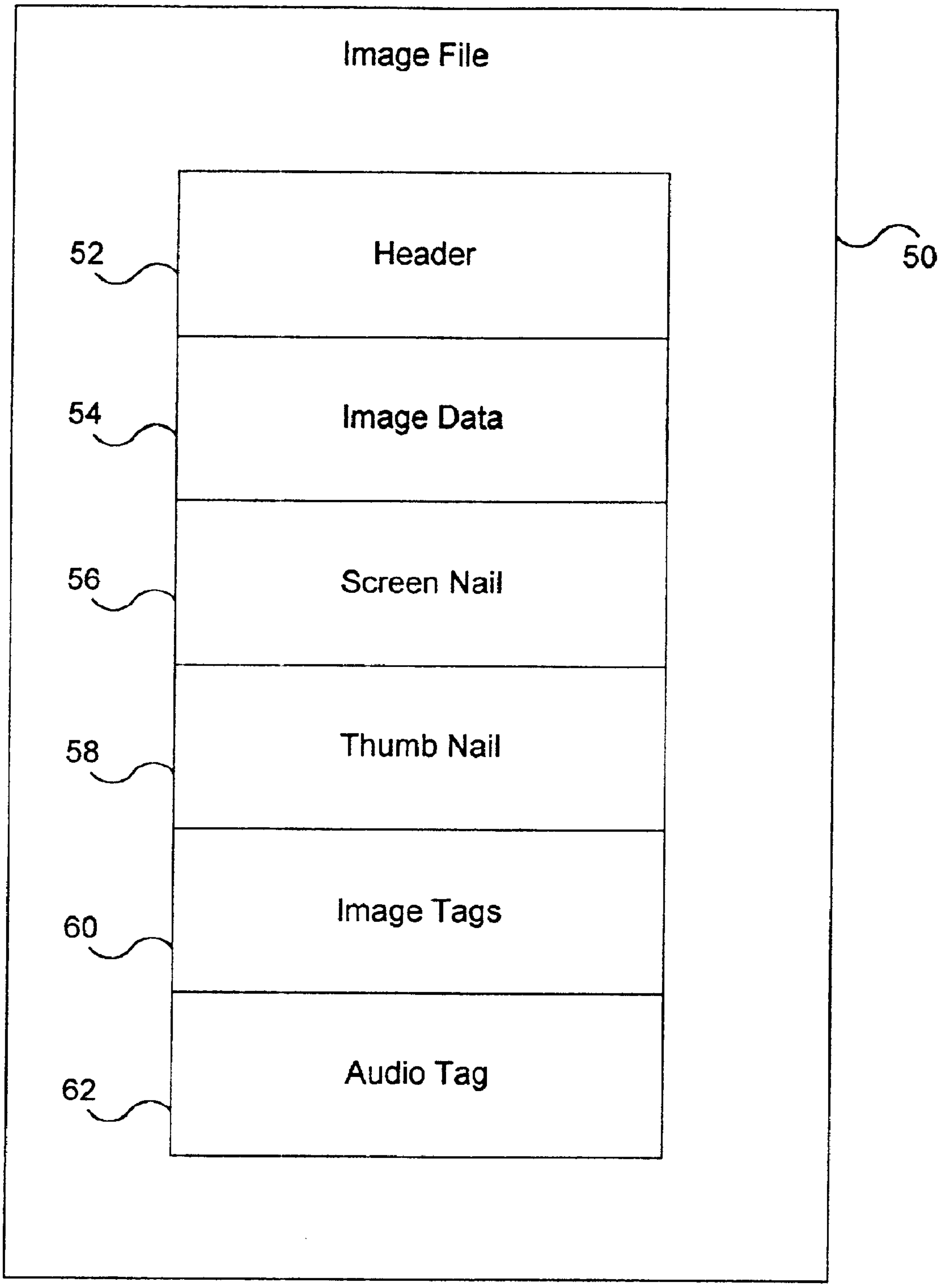


Image File
Header
Image Data
Screen Nail
Thumb Nail
Image Tags
Audio Tag
52
54
56
58
60
62
50

FIG. 2

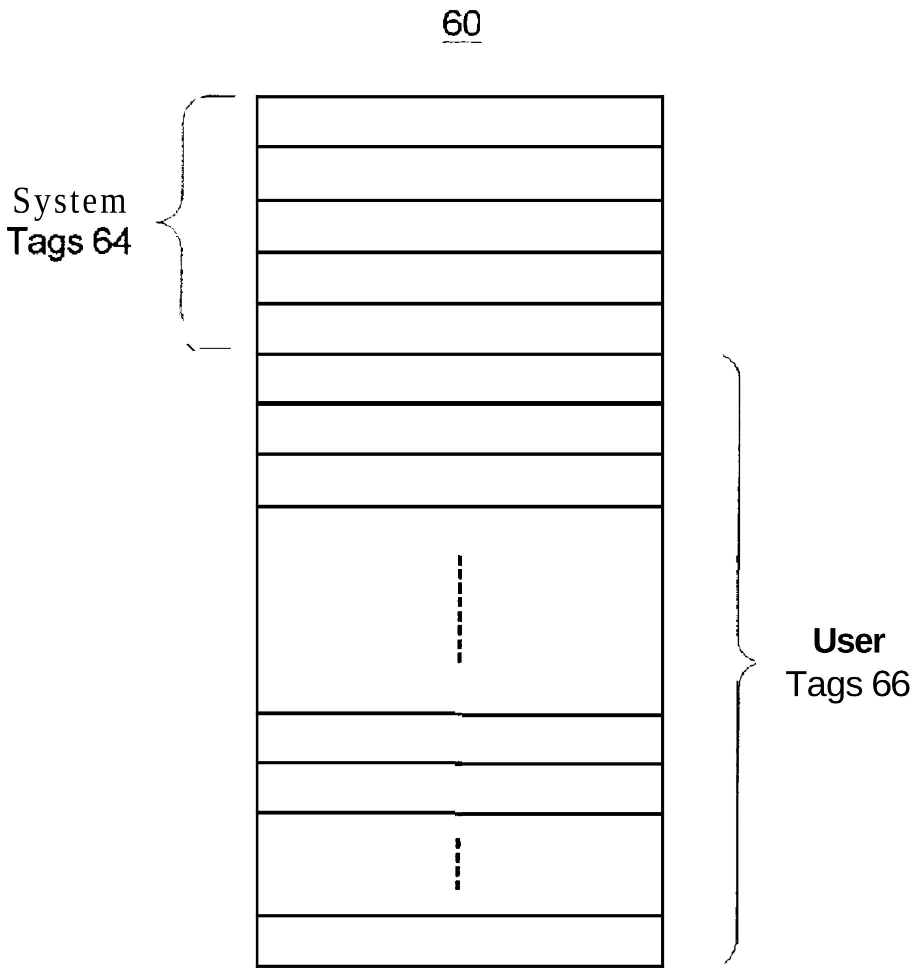

60
System
Tags 64
User
Tags 66

FIG. 3

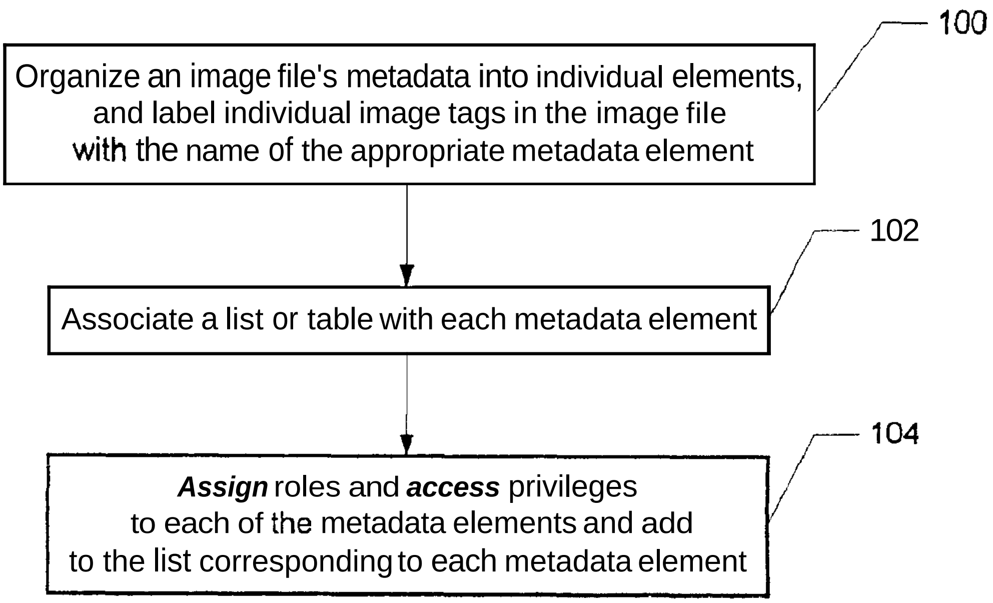

100
Organize an image file's metadata into individual elements, and label individual image tags in the image file with the name of the appropriate metadata element
102
Associate a list or table with each metadata element
104
Assign roles and ***access*** privileges to each of the metadata elements and add to the list corresponding to each metadata element

FIG. 4

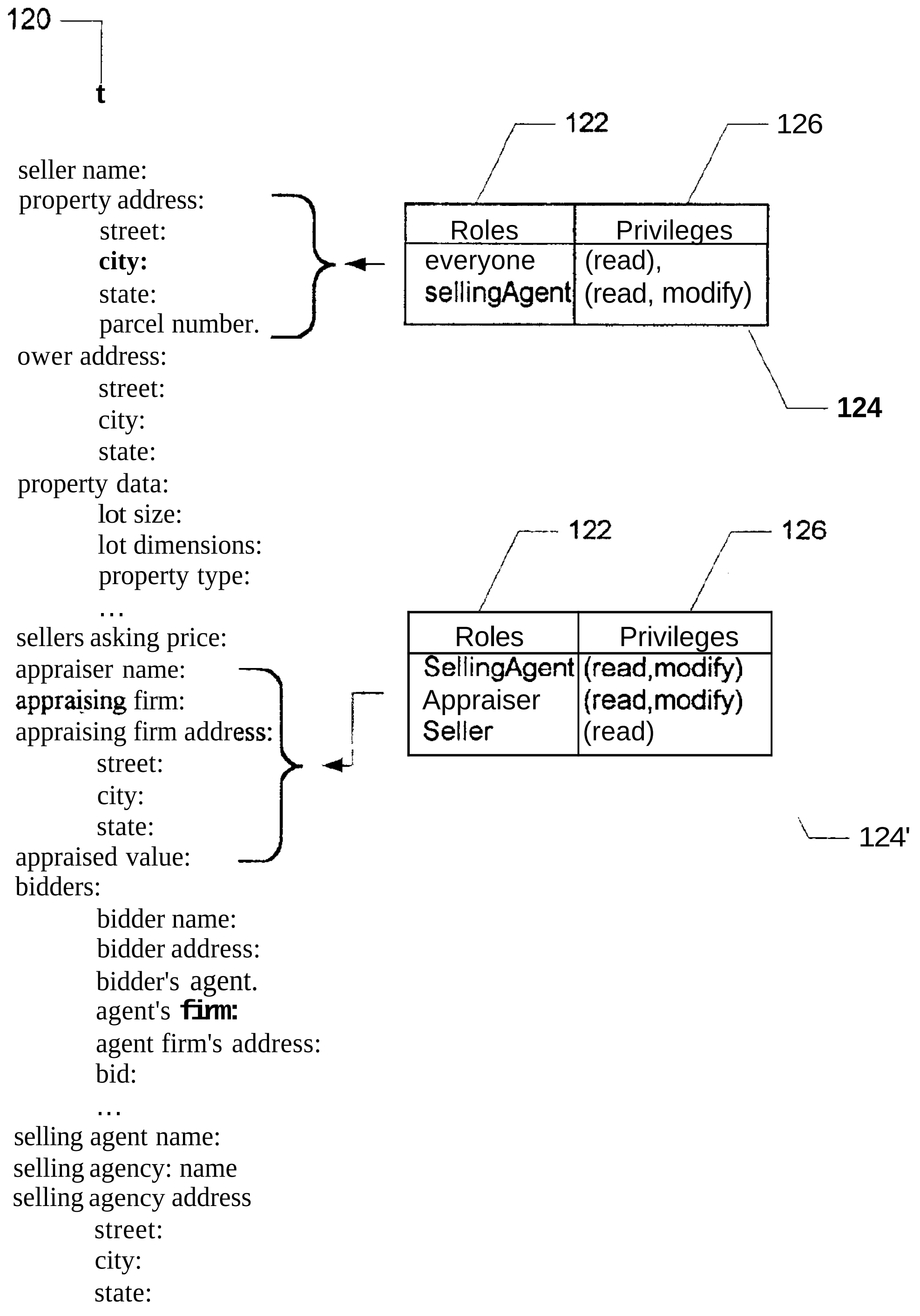

120
122
126
seller name:
property address:
street:
city:
state:
parcel number.
ower address:
street:
city:
state:
property data:
lot size:
lot dimensions:
property type:
...
sellers asking price:
appraiser name:
appraising firm:
appraising firm address:
street:
city:
state:
appraised value:
bidders:
bidder name:
bidder address:
bidder's agent.
agent's firm:
agent firm's address:
bid:
...
selling agent name:
selling agency: name
selling agency address
street:
city:
state:
Roles
Privileges
everyone
(read),
sellingAgent
(read, modify)
124
122
126
Roles
Privileges
SellingAgent
(read,modify)
Appraiser
(read,modify)
Seller
(read)
124'

FIG. 5

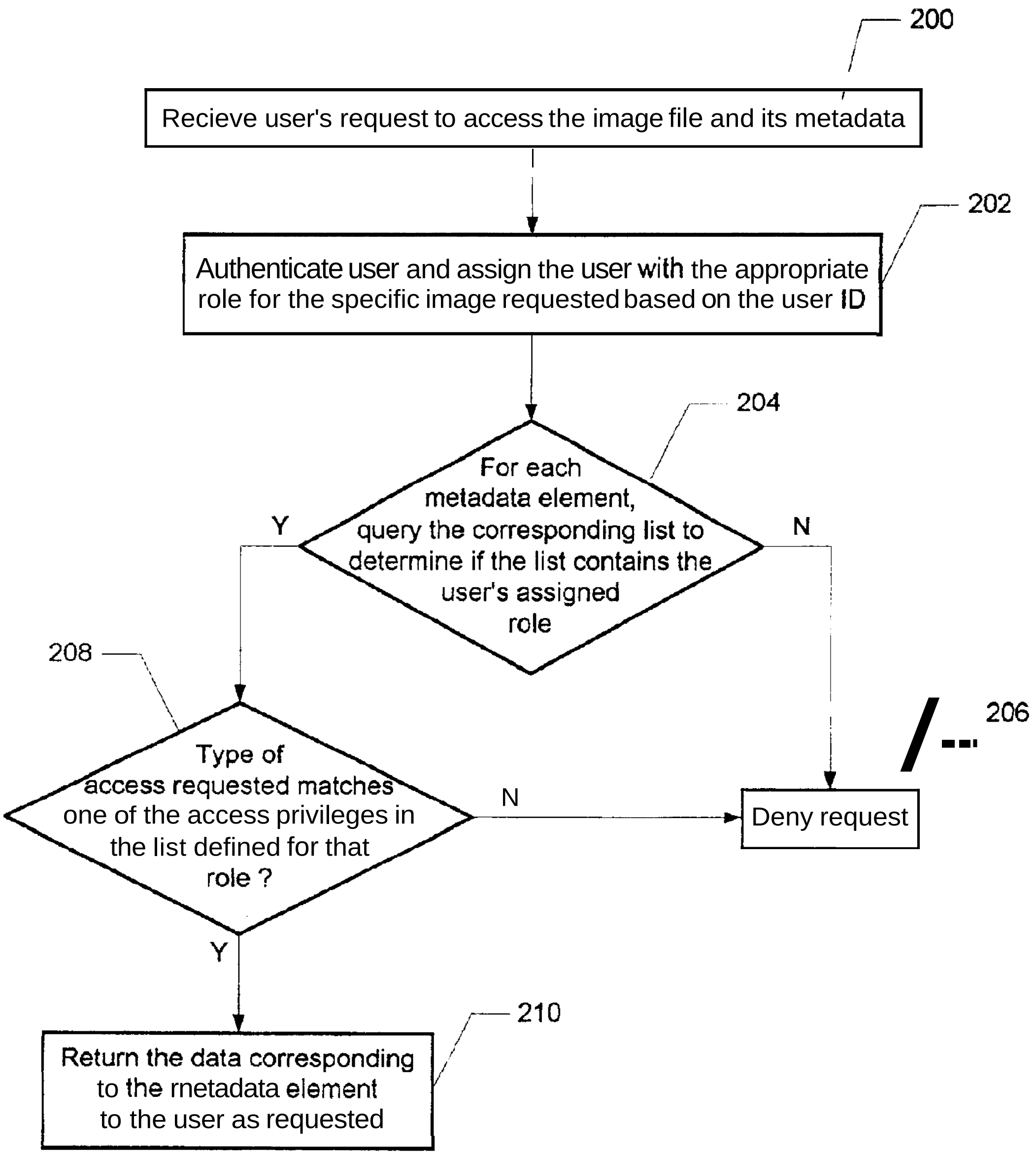

200
Recieve user's request to access the image file and its metadata
202
Authenticate user and assign the user with the appropriate role for the specific image requested based on the user ID
204
For each metadata element, query the corresponding list to determine if the list contains the user's assigned role
Y
N
208
Type of access requested matches one of the access privileges in the list defined for that role ?
N
Deny request
206
Y
210
Return the data corresponding to the rnetadata element to the user as requested

FIG. 6

ROLE-BASED ACCESS TO IMAGE METADATA

FIELD OF THE INVENTION

The present invention relates to digital image metadata, and more particularly to method and system for controlling which sets of image metadata are accessible to a user.

BACKGROUND OF THE INVENTION

One advantage of digital cameras over film based cameras is that digital cameras have the ability to associate metadata with a captured image that may later be accessed by a viewer. For example, once the digital image has been transferred from the digital camera to a PC and displayed, a user may also view information about the image, such as date and time of capture, the name of the image, and image size, for instance. Metadata may be either stored with the image or stored separately in a separate database. If the metadata is stored with the image, then the metadata is typically stored as tags within the image file of the captured image.

For example, a standards organization referred to as the Digital Imaging Group (DIG) has developed a DIG35 Metadata Specification that provides a set of metadata definitions to the imaging industry. The DIG35 metadata specification for describing elements of an image is independent of the imaging application or the image file format used.

By associating metadata with digital images, every image that is uploaded to the Internet and shared with others around the globe may be its own stand-alone catalog record that can be used by each recipient for a variety of purposes.

Businesses, professionals and consumers can all utilize metadata in order to manage images. One example use of metadata is professional photographers associating information about camera settings, copyright information and image manipulation techniques within the image in order to recreate images and document their work. Additionally, metadata enables consumers to share their captured and experiences images by using metadata to tell the story or narration behind their images. For example, users may use image-editing software on their PC to add explanatory captions to each photo from their vacation, and then upload those photos to a photo-sharing website. Assuming the photo website was DIG35 compatible, the photo website would understand and save all the captions. Friends and family may then access the photo website and not only see the pictures, but read and/or hear the story and history behind each image by accessing the metadata.

The use of metadata with digital imaging provides users with the advantage of being able to access a wide variety of data regarding the image. When a user accesses the image, however, the user is typically shown all the metadata associated with that image. Access to the metadata is currently an all are nothing proposition when a user views the metadata via a photo-sharing site, or when the metadata is retrieved from an image file directly or from a database. Although each user of the metadata may have different interest and needs with respect to the metadata, there is currently no control over what each user views, adds, or edits.

Accordingly, what is needed is an improved method for providing users access to digital image metadata. The present invention addresses such a need.

SUMMARY OF THE INVENTION

The present invention provides a method and system for controlling access to image metadata. The method and system include associating users who will access the image with roles, and associating the roles with individual metadata elements. In response to receiving a request for access to the metadata by a particular user, the user's role is determined from the request and the user's role is compared to the roles associated with the metadata elements to determine which metadata elements to make available to the user.

According to the system and method disclosed herein, different users of the metadata with different interest in the data will automatically be provided access to only the metadata that they need to view, add, or edit based on their assigned roles.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a block diagram illustrating one possible system environment for use with the present invention in accordance with a preferred embodiment.

FIG. **2** is a block diagram illustrating a diagram of one embodiment for an image file.

FIG. **3** is a diagram showing of one embodiment for the image tags.

FIG. **4** is a flow chart illustrating the process for assigning roles and access privileges to metadata elements in further detail.

FIG. 5 is a diagram illustrating an example set of metadata and roles assigned to the metadata for use in a real estate application.

FIG. **6** is a flow chart illustrating the process of determining whether to grant or deny a request for image metadata in one preferred embodiment.

DESCRIPTION OF THE INVENTION

The present invention relates to enabling the customization of tags within digital images captured with an image capture device. The following description is presented to enable one of ordinary skill in the art to make and use the invention and is provided in the context of a patent application and its requirements. Various modifications to the preferred embodiment will be readily apparent to those skilled in the art and the generic principles herein may be applied to other embodiments. For example, although the preferred embodiment explained in terms of a digital camera, one of ordinary skill in the art will readily recognize that any portable device capable of capturing images could be used, such as a cellphone or PDA equipped with a lens attachment, for instance. Thus, the present invention is not intended to be limited to the embodiments shown but is to be accorded the widest scope consistent with the principles and features described herein.

FIG. **1** is a block diagram illustrating one possible system environment for use with the present invention in accordance with a preferred embodiment. The system **10** includes one or more digital cameras **14** and an online photo-service site **16.** The digital cameras **14** capture digital images and store the images on an internal memory, and have the capability of uploading the captured images to the online photo-service site **16** either directly or via a PC. To upload the images directly from the cameras **14**, the cameras **14** may be provided with wireless connectivity for connecting to the Internet, although a wired connection method may also be used. In one embodiment, the cameras **14** may connect to the Internet via a service provider **26,** which may include a wireless carrier and/or an Internet service provider (ISP).

The online photo-service site **16** includes a gateway server **18** for receiving the images and an image database **20** for storing the images. The photo-service **16** may include other servers besides the gateway server **18,** but for simplicity, the function of the other servers will be described as being performed by the gateway server **18.** Once the images are uploaded, the images may be stored in a user or business account. The images and their metadata may then be viewed and managed over the Internet by users **24** through a web browser or other software application. Users may also access the images from the gateway server **18** directly from the digital cameras **14** or other such portable electronic device.

FIG. **2** is a block diagram illustrating a diagram of one embodiment for an image file **50.** Image file **50** preferably includes a header **52,** image data **54,** a screennail **56,** a thumbnail **58,** image tags **60,** and an audio tag **62.** Header **52** preferably includes information that identifies and describes the various contents of image file **50.** Image data **54** contains actual captured image data, the resolution of which depends on the settings of the camera **14**. Image data **54** is typically stored in JPEG format, but may exist in whichever format is appropriate for the current location of image file **50** within the image processing chain of the camera **110.** Screennail **56** and thumbnail **58** are each different versions of image data **54** that have varying degrees of reduced resolution for a number of special viewing applications.

The metadata for the images is preferably stored within the image file **50** in individual image tags **60,** each of which store various types of data that correspond and relate to particular captured image data **54.** In a preferred embodiment, each image tag **60** may store an individual metadata data element or may store a metadata data structure, described further below. Audio tag **62** stores any sound that has been recorded for the image.

Referring to FIG. **3,** a diagram of one embodiment for the image tags **60** is shown for illustration. In the FIG. **3** embodiment, image tags **60** include system tags **64,** and user tags **66.** System tags **64** preferably include various types of camera information that preserve command settings at the moment of capture and correlate with the captured image data **54.** For example, system tags **64** may indicate focus setting, aperture setting, and other relevant information that may be used for effectively processing or analyzing the corresponding image data. The data written to the system tags **64** is controlled by the camera **14** and preferably cannot be modified by the user **24.**

User tags **66,** however, are provided to enable the storage of data that the user **24** enters on the camera **14** or that was populated by a software application. For example, a stamp tag may be provided for storing a label a user has entered on the camera to apply to a given image, such as "birthday" or "vacation". Thus, the function of the stamp tag is to store label data.

The present invention provides an improved method for allowing users to access metadata associated with a digital image file **50.** The process begins by defining metadata elements for an image file **50.** Particular roles (e.g., job roles) are then associated with the individual metadata elements defined for the image, and each role is assigned certain access privileges for the metadata element to which they are associated, such as read, write, and modify. All users who will access the image are assigned particular roles. In one preferred embodiment, the users are identified by ID numbers, such as a user IDs, class IDs, and/or group IDs, and are then assigned roles based on their IDs.

After the metadata elements in the image file has been populated with data and stored on a server or other device, users may make requests from the server to access the image and its metadata. The user's role is then compared to the roles associated with the metadata elements in the image file to determine what metadata elements to make available to the user for reading, writing or modifying.

In accordance with the present invention, the roles and access privileges associated with the metadata are stored in the image file **50** as metadata that the gateway server **18** accesses to control access to the image as the image file **50.** In an alternative embodiment, the roles and access privileges may be stored in a file separate from the image file **50** and transmitted along with the image file **50.**

Although the software for implementing the present invention preferably resides on the gateway server **18,** where users make request from the gateway server to view images from image database **20,** the software may also be loaded on individual PCs of the users, where the users transmit image files **50** to each other directly.

FIG. **4** is a flow chart illustrating the process for assigning roles and access privileges to metadata elements in further detail. The process begins by organizing an image file's metadata into individual elements, and labeling individual image tags **60** in the image file **50** with the name of the appropriate metadata element in step **100.** Next, a list or table is then associated with each metadata element in step **102.** The roles and access privileges are assigned as appropriate to each of the metadata elements and are added to the list corresponding to each metadata element in step **104.** Each metadata element may comprise a variable or a data structure. The set of metadata elements defined for a particular type of image file **50** and the roles associated with the metadata are application-specific, as shown in FIG. **5.**

FIG. **5** is a diagram illustrating an example set of metadata and roles assigned to the metadata for use in a real estate application. For the real estate application, the roles associated with an image might be "sellers agent", "buyers agent", "buyer", "seller", "appraiser", etc. The metadata elements **120** associated with the image might include the properties address, name of seller, sellers asking price, a list of bidders and their current bids, bidders credit ratings, seller's current mortgage information, the properties characteristics such as dimensions, amenities, and so on.

A list **124** is associated with each metadata element **120** or group of elements **120,** which includes the roles **122** that are allowed to access that metadata element **120** and the access privileges **126** defining what type of access allowed. For example, an appraiser would be allowed read access to property data, which characterizes the property: its address, dimensions, amenities, and other data related to valuation. The appraiser would be allowed to add the appraisal value to the metadata. An appraiser would not be allowed access to the seller's asking price or any of the bid information. The two agents may be allowed to see all the data.

After the metadata elements **120,** the roles **122,** and the access privileges **126** are defined for a particular type of image file **50,** the image file **50** is used to store actual image data **54** and the metadata elements (tags **60)** within image file **50** are populated with data. After that image file **50** containing the data has been stored, different users may make requests to access the image file **50** and its metadata.

FIG. **6** is a flow chart illustrating the process of determining whether to grant or deny a request for image metadata in one preferred embodiment. The user's request to access the image file **50** and its metadata is received in step **200.** In a preferred embodiment, the request includes the user's ID and identifies the type of access desired. The user is then authenticated and assigned the appropriate role for the specific image requested based on the user ID in step **202.** For each metadata element, the corresponding list is queried to determine if the list contains the user's assigned role in step **204.** If the user's role is not found in the list, access to that metadata element is denied in step **206**. If the user's role is found in a list, then it is determined if the type of access requested matches one of the access privileges in the list defined for that role in step **208.** If the type of access requested matches one of the access privileges in the list, then the data corresponding to the metadata element is returned to the user as requested in step **210.** If the type of access requested does not match one of the access privileges in the list in step **208,** then the request to access the image metadata is denied in step **206.**

As an example, assume the user submitted a request to "view" the metadata associated with a particular image. If the role assigned to the user does not match the role assigned to any of the metadata elements, the user will not be allowed to view any of the metadata. If the role assigned to the user does match the role assigned to one of the metadata elements, but the access privileges assigned to that role for the element does not include the view privilege, the user will not be allowed to view the data for that element.

According to the system and method disclosed herein, different users of the metadata with different interest in the data will automatically be provided access to only the metadata that they need to view, add, or edit based on their assigned roles.

A method for controlling user access to image metadata has been disclosed. Although the present invention has been described in accordance with the embodiments shown, one of ordinary skill in the art will readily recognize that there could be variations to the embodiments and those variations would be within the spirit and scope of the present invention. Accordingly, many modifications may be made by one of ordinary skill in the art without departing from the spirit and scope of the appended claims.

What is claimed is:

1. A method for controlling access to image metadata, comprising the steps of:

(a) defining metadata elements for an image;

(b) associating users who will access the image with roles;

(c) associating the roles with individual metadata elements;

(d) receiving a request for access to the metadata by a particular user, wherein the user's role is determined from the request; and

(e) comparing the user's role to the roles associated with the metadata elements to determine which metadata elements to make available to the user.

2. The method of claim **1** further including the step of assigning access privileges to each of the roles.

3. The method of claim **2** further including the step of allowing the user to read, write, or modify the metadata based on the access privilege of the user's role.

4. The method of claim **3** further including the step of assigning user IDs to the users and to the individual metadata elements.

5. The method of claim **4** further including the step of receiving the user's ID in the request and using the user's ID to determine the user's role.

6. The method of claim **5** further including the step of associating a list with each metadata element, the list including roles assigned to the metadata element and corresponding access privileges.

7. The method of claim **6** further including the step of denying the request if the role assigned to the user does not match any of the roles assigned to the metadata elements.

8. The method of claim **7** further including the step of denying the request if access privileges assigned to the user do not match the assess privilege assigned to the metadata element.

9. A system for controlling access to image metadata comprising:

means for defining metadata elements for an image;

means for associating users who will access the image with roles;

means for associating the roles with individual metadata elements;

means for receiving a request for access to the metadata by a particular user, wherein the user's role is determined from the request; and

means for comparing the user's role to the roles associated with the metadata elements to determine which metadata elements to make available to the user.

10. The system of claim **9** wherein access privileges are assigned to each of the roles.

11. The system of claim **10** wherein the user is allowed to read, write, or modify the metadata based on the access privilege of the user's role.

12. The system of claim **11** wherein user IDs are assigned to the users and to the individual metadata elements.

13. The system of claim **12** wherein the user's ID is received in the request and using the user's ID to determine the user's role.

14. The system of claim **13** wherein a list is associated with each metadata element, the list including roles assigned to the metadata element and corresponding access privileges.

15. The system of claim **14** wherein the request is denied if the role assigned to the user does not match any of the roles assigned to the metadata elements.

16. The system of claim **15** wherein the request is denied if access privileges assigned to the user do not match the assess privilege assigned to the metadata element.

17. A computer readable medium containing program instructions for controlling access to image metadata, the instructions for:

(a) defining metadata elements for an image;

(b) associating users who will access the image with roles;

(c) associating the roles with individual metadata elements;

(d) receiving a request for access to the metadata by a particular user, wherein the user's role is determined from the request; and

(e) comparing the user's role to the roles associated with the metadata elements to determine which metadata elements to make available to the user.

18. The computer readable medium of claim **17** further including the instruction of assigning access privileges to each of the roles.

19. The computer readable medium of claim **18** further including the instruction of allowing the user to read, write, or modify the metadata based on the access privilege of the user's role.

20. The computer readable medium of claim **19** further including the instruction of assigning user IDs to the users and to the individual metadata elements.

21. The computer readable medium of claim **20** further including the instruction of receiving the user's ID in the request and using the user's user ID to determine the user's role.

22. The computer readable medium of claim **21** further including the instruction of associating a list with each metadata element, the list including roles assigned to the metadata element and corresponding access privileges.

23. The computer readable medium of claim **22** further including the instruction of denying the request if the role assigned to the user does not match any of the roles assigned to the metadata elements.

24. The computer readable medium of claim **23** further including the instruction of denying the request if access privileges assigned to the user do not match the assess privilege assigned to the metadata element.

25. A method for controlling access to image metadata, comprising the steps of:

(a) defining metadata elements for an image file;

(b) associating particular roles with individual metadata elements;

(c) assigning each role certain access privileges for the metadata element to which the access privileges are associated;

(d) assigning particular roles to users who will access the image;

(e) after the image file being populated with data and stored, receiving a request to access the image and its metadata, wherein the role assigned to the user is determined from the request; and

(f) comparing the role assigned to the user with the roles associated with the metadata elements in the image file to determine what metadata elements to make available to the user for reading, writing or modifying.

26. The method of claim **25** further including the step of associating a list with at least one metadata element that indicates the roles that are allowed to access that metadata element and the access privileges defining what type of access allowed.

27. The method of claim **26** further including the step of determining whether to grant or deny access to the metadata by:

for each metadata element, querying the corresponding list to determine if the list contains the role assigned to the user;

if the user's role is not found in the list, denying access to that metadata element;

if the user's role is found in a list, then determining if the type of access requested matches one of the access privileges in the list defined for that role;

if the type of access requested matches one of the access privileges in the list, returning data corresponding to the metadata element to the user as requested; and

if the type of access requested does not match one of the access privileges in the list, denying the request to access the image metadata.

28. The method of claim **27** further including the step of storing the roles and access privileges associated with the metadata in the image file.

29. The method of claim **27** further including the step of storing the roles and access privileges in a file separate from the image file.

30. A method for controlling access to image metadata, comprising the steps of:

(a) defining metadata elements for an image;

(b) associating users who will access the image with IDs;

(c) associating the IDs with individual metadata elements;

(d) receiving a request for access to the metadata by a particular user, wherein the request includes the user's ID; and

(e) comparing the user's ID to the IDs associated with the metadata elements to determine which metadata elements to make available to the user.

31. The method of claim **30** further including the step of assigning access privileges to each of the IDs associated with the metadata elements.

32. The method of claim **31** further including the step of allowing the user to read, write, or modify each metadata element when the user's ID matches the ID associated with each metadata element.

33. A network server for controlling access to image file metadata, comprising:

means for storing a plurality of image files, each of the image files having metadata elements defined therein and data populating each of the metadata elements, each of the image files further including a list of roles and access privileges associated with each of the metadata elements;

means for receiving a request for one of the image files from a user, wherein the user is assigned at least one role;

means for determining the role assigned to the user from the request; and

means for comparing the role assigned to the user with the roles associated with the metadata elements in the image file to determine what metadata elements to make available to the user.

* * * * *